

## AMENDMENTS TO THE CLAIMS

1-7. (Cancelled)

8. (Currently Amended) An apparatus for encoding 10 consecutive input bits indicating a TFCI (Transport Format Combination Indicator) into a sequence of 48 symbols in an NB-TDD mobile communication system, the apparatus for encoding having at least an orthogonal sequence generator, a mask sequence generator, and adder, and a puncturer, the apparatus comprising:

an orthogonal sequence generator for creating a plurality of biorthogonal sequences having a length of at least  $2^n$  where  $2^n > 48$ , and outputting a biorthogonal sequence selected from the biorthogonal sequences by first information bits of the TFCI;

a mask sequence generator for creating a plurality of mask sequences, and outputting a mask sequence selected from the mask sequences by second information bits of the TFCI;

an adder for adding a biorthogonal sequence from the orthogonal sequence generator and a mask sequence from the mask sequence generator; and

a puncturer for performing puncturing on sequences output from the adder so as to output the sequence of 48 symbols,

wherein the puncturer performs puncturing according to one of following puncturing patterns:

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}

{0, 4, 8, 13, 16, 21, 25, 28, 32, 37, 43, 44, 49, 52, 56, 62}

{0, 4, 8, 13, 16, 21, 25, 31, 32, 37, 43, 44, 49, 52, 56, 61}

{0, 4, 8, 13, 18, 21, 25, 30, 35, 36, 40, 46, 50, 53, 57, 62}

{0, 4, 8, 13, 18, 21, 25, 30, 35, 37, 40, 47, 50, 53, 57, 62}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 49, 55, 58, 61}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 56, 63}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 58, 61}

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}.

9-18. (Cancelled)

19. (Currently Amended) A method for encoding 10 consecutive input bits indicating a TFCI (Transport Format Combination Indicator) of each of successively transmitted frames into a sequence of 48 symbols in an NB-TDD mobile communication system, comprising:

creating in an orthogonal sequence generator a plurality of biorthogonal sequences having a length of at least  $2^n$  where  $2^n > 48$ , and outputting a biorthogonal sequence selected from the biorthogonal sequences by first information bits of the TFCI;

creating in a mask sequence generator a plurality of mask sequences, and outputting a mask sequence selected from the mask sequences by second information bits of the TFCI;

adding in an adder the selected biorthogonal sequence and the mask sequence; and

performing puncturing in a puncturer on sequences output from the adder so as to output the sequence of 48 symbols,

wherein the puncturing is performed according to one of following puncturing patterns:

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}

{0, 4, 8, 13, 16, 21, 25, 28, 32, 37, 43, 44, 49, 52, 56, 62}

{0, 4, 8, 13, 16, 21, 25, 31, 32, 37, 43, 44, 49, 52, 56, 61}

{0, 4, 8, 13, 18, 21, 25, 30, 35, 36, 40, 46, 50, 53, 57, 62}

{0, 4, 8, 13, 18, 21, 25, 30, 35, 37, 40, 47, 50, 53, 57, 62}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 49, 55, 58, 61}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 56, 63}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 58, 61}

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}.

20-24. (Cancelled)

25. (Previously Presented) An apparatus for encoding 10 consecutive input bits indicating a TFCI (Transport Format Combination Indicator) of each 48 symbols in a mobile communication system, the apparatus for encoding having at least a second order Reed Muller code generator and a puncturer, the apparatus comprising:

a (64,10) second order Reed Muller code generator for generating 64 coded symbols by using length 64 Walsh codes and length 64 masks in response to the input bits; and

a puncturer for puncturing 16 symbols out of the 64 coded symbols wherein puncturing positions of the 16 symbols are as follows:

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}.

26-28. (Cancelled)

29. (Previously Presented) A method for encoding 10 consecutive input bits indicating a TFCI (Transport Format Combination Indicator) of each 48 symbols in an NB-TDD mobile communication system, comprising the step of:

second order Reed Muller coding for generating in a second order Reed Muller code generator 64 coded symbols by using length 64 Walsh codes and length 64 masks in response to the input bits; and

generating 48 symbols by puncturing 16 symbols out of the 64 coded symbols wherein puncturing positions of the 16 symbols in a puncturer are as follows:

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}.

30. (Previously Presented) The method as claimed in claim 29, wherein the Walsh codes comprise a 1<sup>st</sup> Walsh code, a 2<sup>nd</sup> Walsh code, a 4<sup>th</sup> Walsh code, an 8<sup>th</sup> Walsh code, a 16<sup>th</sup> Walsh code and a 32<sup>nd</sup> Walsh code, selected from 64 Walsh orthogonal sequences of length 64.

31. (Previously Presented) The method as claimed in claim 29, wherein the masks comprise mask sequences of

00110101011011110100011000001101111011001010011100111111000101,  
010001111010001111011010111101101111011000100100101101000110111000, and  
0001100011100111110101001101010010111101101111010111000110001110.

32. (Previously Presented) The apparatus as claimed in claim 25, wherein the encoder comprises:

a 1-bit generator for generating a sequence of same symbols;  
a basis orthogonal sequence generator for generating a plurality of basis orthogonal sequences;  
a basis mask sequence generator for generating a plurality of basis mask sequences; and  
an operator for receiving the TFCI including a first information part indicating conversion to a biorthogonal sequence, a second information part indicating conversion to an orthogonal sequence and a third information part indicating conversion to a mask sequence, and generating the sequence of 64 symbols by combining an orthogonal sequence selected from the basis orthogonal sequences by the second information part, a biorthogonal sequence constructed by a combination of the selected orthogonal sequence and the same symbols selected by the first information part, and a mask sequence selected by the third information part.

33. (Previously Presented) The apparatus as claimed in claim 25, wherein the length 64 Walsh codes comprise a 1<sup>st</sup> Walsh code, a 2<sup>nd</sup> Walsh code, a 4<sup>th</sup> Walsh code, an 8<sup>th</sup> Walsh code, a 16<sup>th</sup> Walsh code and a 32<sup>nd</sup> Walsh code, selected from 64 orthogonal sequences of length 64.

34. (Previously Presented) The apparatus as claimed in claim 25, wherein the masks comprise mask sequences of

0011010101101111010001100000110111011001010011100111111000101,  
010001111010001110110101110110111011000100101101000110111000, and  
000110001110011111010100110100101110110111010111000110001110.

35. (Previously Presented) The apparatus as claimed in claim 32, wherein the operator comprises:

a first multiplier for multiplying the same symbols by the first information part;  
a plurality of second multipliers for multiplying the basis orthogonal sequences by TFCI bits constituting the second information part;  
a plurality of third multipliers for multiplying the basis mask sequences by TFCI bits constituting the third information part; and

an adder for generating the sequence of 64 symbols by adding outputs of the first to third multipliers.

36. (Previously Presented) The apparatus as claimed in claim 25, wherein the puncturer performs puncturing according to any one of puncturing patterns given below:

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}

{0, 4, 8, 13, 16, 21, 25, 28, 32, 37, 43, 44, 49, 52, 56, 62}

{0, 4, 8, 13, 16, 21, 25, 31, 32, 37, 43, 44, 49, 52, 56, 61}

{0, 4, 8, 13, 18, 21, 25, 30, 35, 36, 40, 46, 50, 53, 57, 62}

{0, 4, 8, 13, 18, 21, 25, 30, 35, 37, 40, 47, 50, 53, 57, 62}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 49, 55, 58, 61}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 56, 63}

{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 58, 61}

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}

37. (Previously Presented) The method as claimed in claim 29, wherein the encoding step comprises the steps of:

generating a sequence of same symbols;

generating a plurality of basis orthogonal sequences;

generating a plurality of basis mask sequences; and

receiving the TFCI including a first information part indicating conversion to a biorthogonal sequence, a second information part indicating conversion to an orthogonal sequence and a third information part indicating conversion to a mask sequence, and generating the sequence of 64 symbols by combining an orthogonal sequence selected from the basis orthogonal sequences by the second information part, a biorthogonal sequence constructed by a combination of the selected orthogonal sequence and the same symbols selected by the first information part, and a mask sequence selected by the third information part.

38. (Previously Presented) The method as claimed in claim 29, wherein the puncturing is performed according to any one of puncturing patterns given below:

{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}  
{0, 4, 8, 13, 16, 21, 25, 28, 32, 37, 43, 44, 49, 52, 56, 62}  
{0, 4, 8, 13, 16, 21, 25, 31, 32, 37, 43, 44, 49, 52, 56, 61}  
{0, 4, 8, 13, 18, 21, 25, 30, 35, 36, 40, 46, 50, 53, 57, 62}  
{0, 4, 8, 13, 18, 21, 25, 30, 35, 37, 40, 47, 50, 53, 57, 62}  
{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 49, 55, 58, 61}  
{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 56, 63}  
{0, 4, 8, 13, 19, 22, 27, 30, 33, 36, 41, 44, 50, 52, 58, 61}  
{0, 4, 8, 13, 16, 20, 27, 31, 34, 38, 41, 44, 50, 54, 57, 61}

39. (Previously Presented) The apparatus as claimed in claim 25, wherein the (64,10) second order Reed Muller code generator generates 64 coded symbols by using length 64 all 1's sequence in response to the input bits.

40. (Previously Presented) The method as claimed in claim 29, wherein the (64,10) second order Reed Muller coding step uses length 64 all 1's sequence in response to the input bits to generate 64 coded symbols.

41. (Previously Presented) The apparatus as claimed in claim 8, wherein the plurality of biorthogonal sequences is comprised of a all 1's sequence, a 1<sup>st</sup> Walsh code, a 2<sup>nd</sup> Walsh code, a 4<sup>th</sup> Walsh code, an 8<sup>th</sup> Walsh code, a 16<sup>th</sup> Walsh code and a 32<sup>nd</sup> Walsh code, selected from 64 Walsh orthogonal sequences of length 64.

42. (Previously Presented) The apparatus as claimed in claim 8, wherein the plurality of mask sequences is comprised of

0011010101101111010001100000110111011001010011100111111000101,  
0100011110100011110110101110110111011000100101101000110111000 and  
00011000111001111010100110100101110110111000110001110.

43. (Previously Presented) The method as claimed in claim 19, wherein the plurality of biorthogonal sequences is comprised of a all 1's sequence, a 1<sup>st</sup> Walsh code, a 2<sup>nd</sup> Walsh code, a 4<sup>th</sup> Walsh code, an 8<sup>th</sup> Walsh code, a 16<sup>th</sup> Walsh code and a 32<sup>nd</sup> Walsh code, selected from 64 Walsh orthogonal sequences of length 64.

44. (Previously Presented) The method as claimed in claim 19, wherein the plurality of mask sequences is comprised of

00110101011011110100011000001101111011001010011100111111000101,  
0100011111010001111011010111101101111011000100101101000110111000 and  
0001100011100111110101001101010010111101101111010111000110001110.